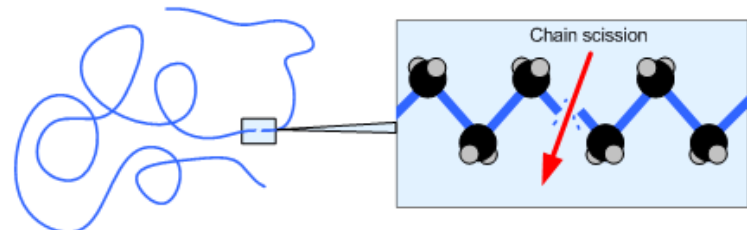
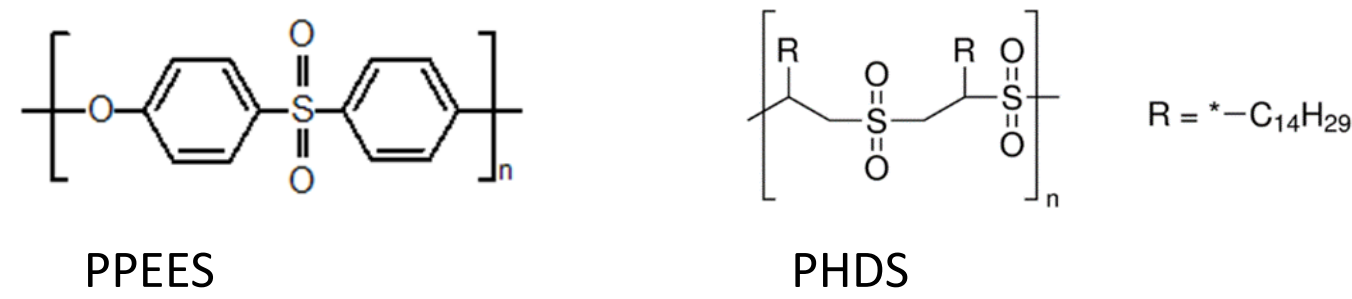


ABSORPTION OF EUV RADIATION IN MATTER AND RELATED PROCESSES



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Materials erosion occurs due to the formation of volatile products of the polymer radiolysis evaporated from the irradiated surface into the vacuum

Cold reaction:

decreasing the temperature, the molecules are slower and collide less

EUV ablation

A difference with respect to long-wavelength radiation:

- Absorption is controlled by elemental composition and density
- plasma formation is not restricting the interaction

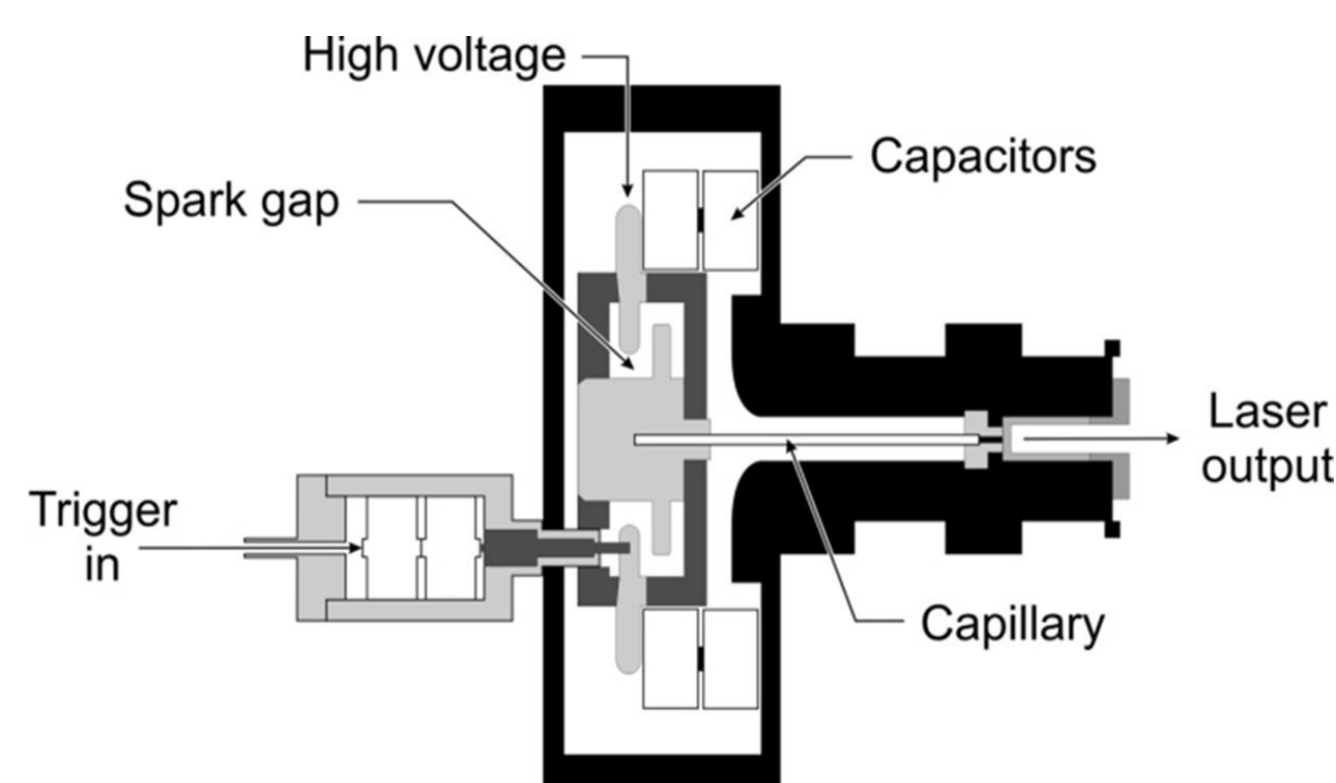
interaction of EUV radiation with matter is due to photo-effect

for shorter wavelengths, the critical density is increasing

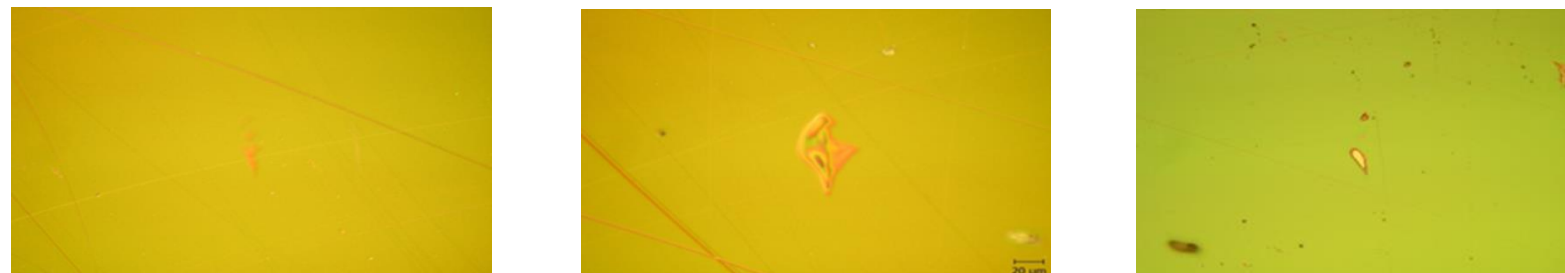
Polysulfones

Critical Factors:

- low thermal stability
- the difficulty in forming good films due to limited solubility in solvents



CDD Laser: results for 1-10-100 shots



Ablation test on PPEES was not obtained at LLG. This can be explained, with respect to the results obtained in Prague, considering that for PPEES, which has a density of about 1.24 g/cm³ and the following elemental composition C₁₈S₄H₁₂, the attenuation lengths at a wavelength of 13.5 nm (photon energy: 91.8 eV) is 215 nm.

The attenuation length at a wavelength of 46.9 nm (photon energy: 26.4 eV) is approx. 20 nm.

So, there is at least one order of magnitude higher energy density in PPEES near-surface region when irradiated at 46.9 nm than in the case of irradiating the material at 13.5 nm at the same surface energy density. Two conclusions follow from this fact:

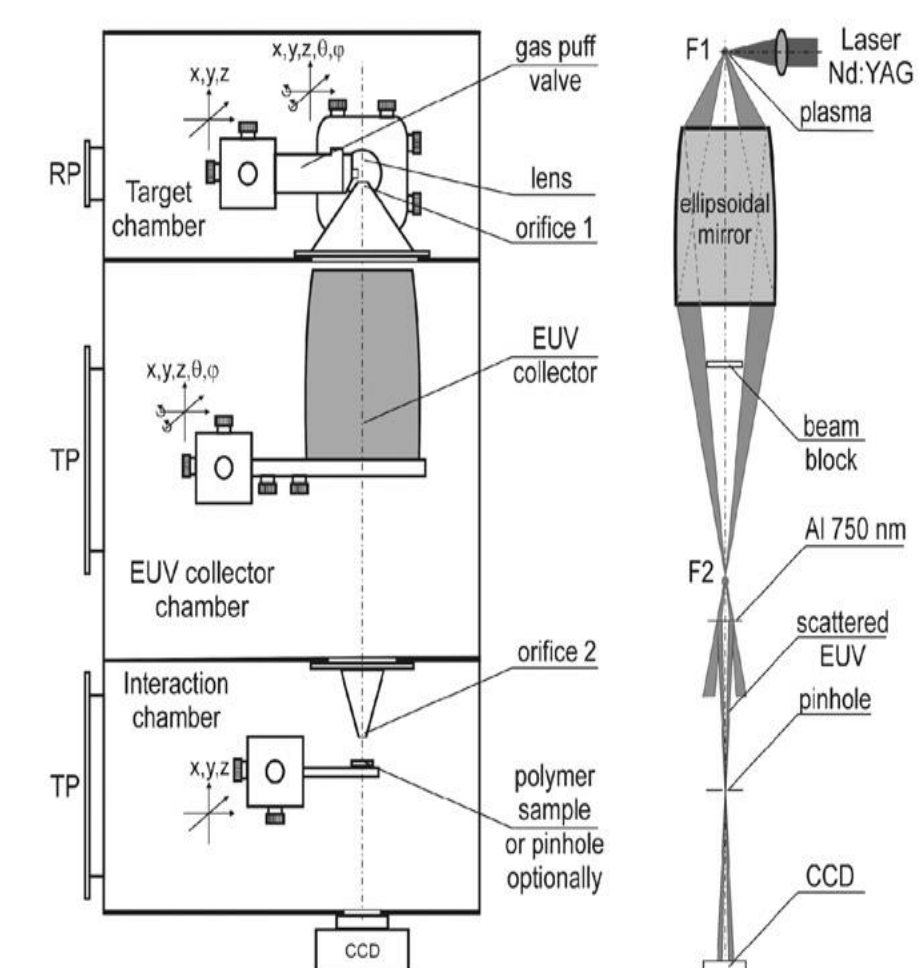
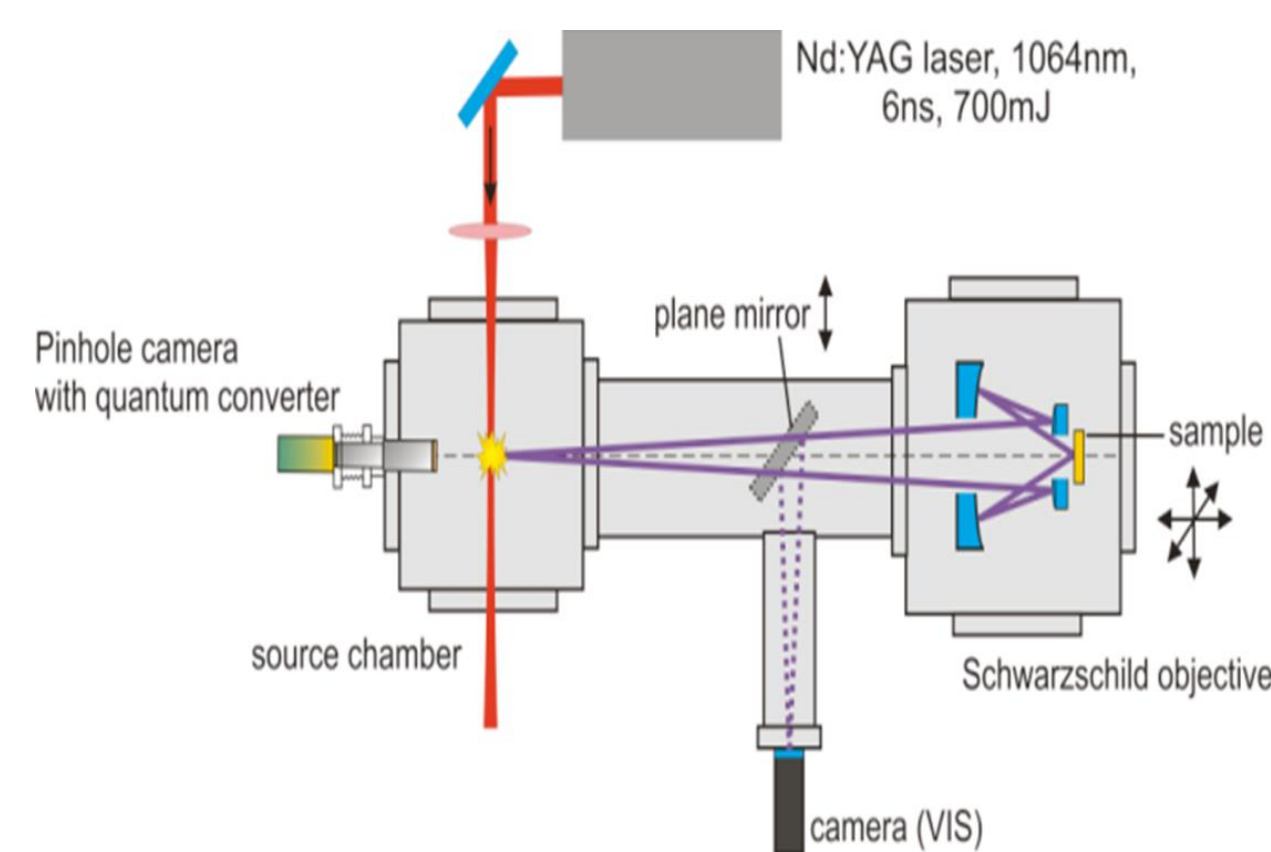
- at 46.9 nm the ablation threshold should be much lower than at 13.5 nm;
- during the exposure at 13.5 nm, the near surface region is not so "overexposed/overheated" as in the previous case (at 46.9 nm), so that single-photon radiolytical processes would play an important role in material ablation, making visible the difference in radiation stability of PPEES and PMMA.

Ablation was obtained in Prague and in Warsaw's laboratories.

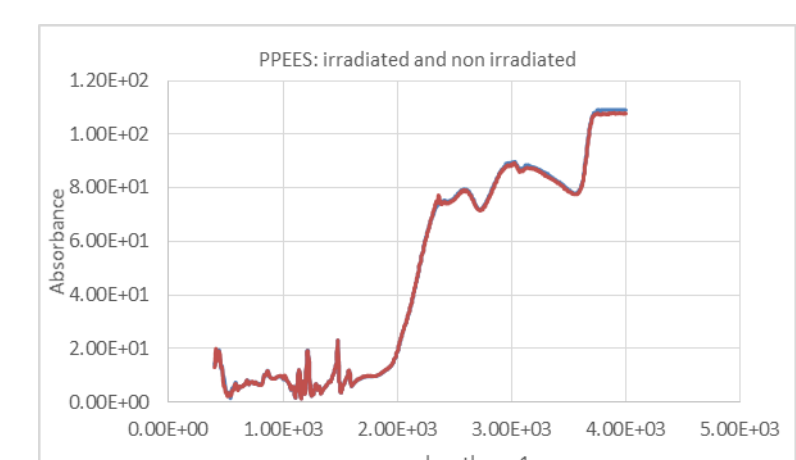
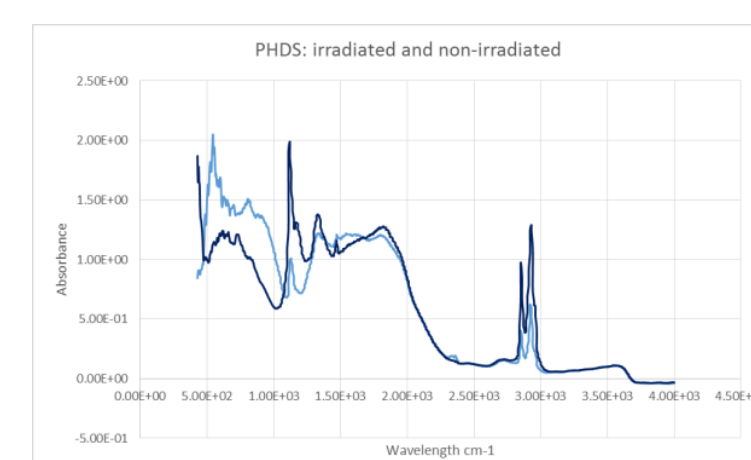
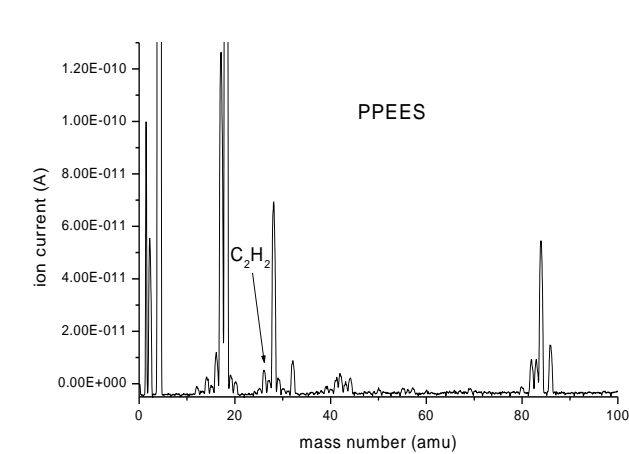
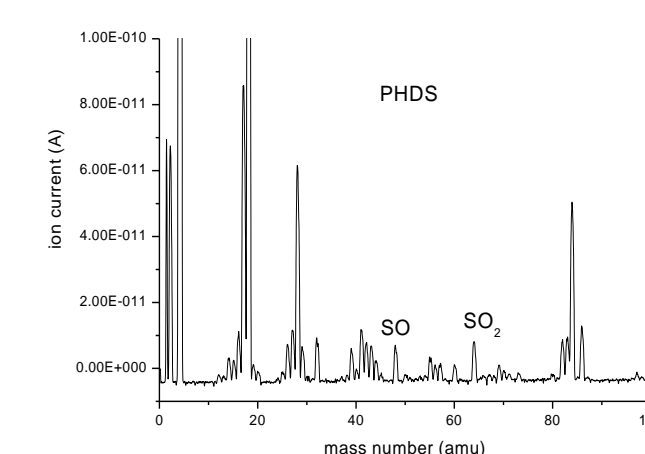
Some conditions are convenient to obtain EUV ablation:

- Non monochromaticity;
- Long wavelength;
- High fluence;
- High density target (to create the plasma).

The performance of any of the sources, evaluated here for the first time, is depending on the polymer under study and, consequently, the advantages and disadvantages must be analyzed, according to this fact, case to case with the respect of the application considered



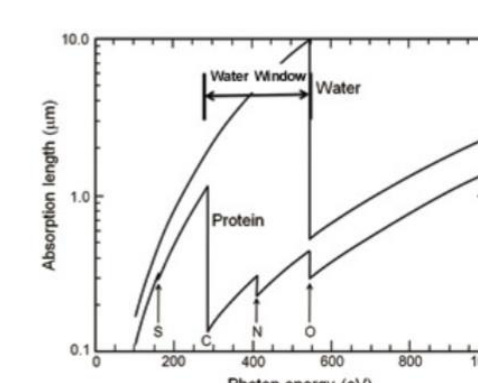
WAT Results



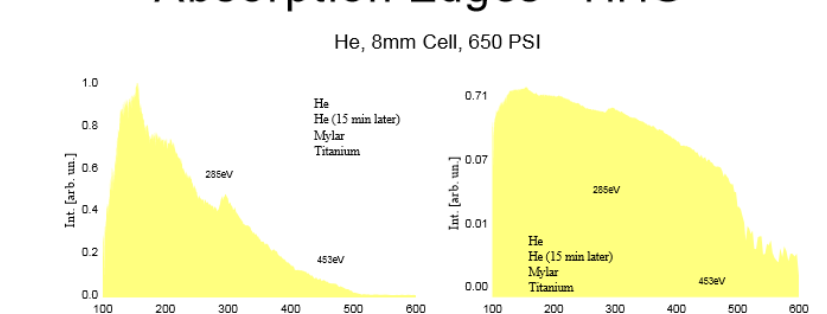
EUV irradiation of both materials does not modify the near surface layer dramatically

INRS-EMT

High brightness soft X-ray pulses in the water window



Absorption Edges - HHG



Experiments performed at the Advanced Laser Light Source, using the 100 Hz high energy optical parametric amplifier. For more information, please contact: Prof. François Légaré, legare@emt.inrs.ca

To be employed for EUV imaging of biological samples

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